VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. Biotechnology
(Five years Integrated Course)

Course outline for the first three years (six semesters)

SEMESTER - V

IBT : 501 Introduction to Genetics Engineering

IBT : 502 Introduction to Biotechnology

IBT : 503 Molecular Biology - II

IBT : 504 Immunology - II

IBT : 505 Introduction to Bioinformatics

IBT : 506 Practicals

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. (Biotechnology) (Five Year Integrated)

IBT: 501

Course Title: INTRODUCTION TO GENETICS ENGINEERING

UNIT: 1. The aims of Engineering

- Techniques of genetics manipulation
  - Conventional breeding
  - Protoplast and cell cloning
- Potential products of genetics engineering

UNIT: 2. Techniques of genetics Engineering

- Outline of gene cloning
- Gene cloning procedures
  - Restriction Endonucleases
  - Isolation of DNA to be cloned
  - Gene cloning Vectors-Plasmid, Viral DNA and cosmids
  - DNA Ligage-Joining enzyme
  - Transformation and growth of cells
  - Selection of clones
  - Expression of cloned DNA

UNIT: 3. Genetics Manipulation of Eukaryotic cells

- Limitations of bacteria
- plants cells
  - Ti plasmids
  - Cauliflower mosaic virus
  - Direct transformation
- Mammalian cells
  - direct transformation
  - Virus
- Yeast

UNIT: 4. Achievements of and prospects for genetics engineering

- Achievements
  - Transgenic and Gene knockout technologies
  - Targeted gene replacement
  - Chromosome Engineering
  - Gene Therapy
- Problems
  - Expression and plasmid stability
  - Safety
  - Economics
  - Need of basic research
- Furniture
  - Pharmacology
  - Industrial enzymes
  - Breeding
  - Alternatives

REFERENCE :

1. Biotechnology: The Biological Principles by M. D. trevan, S. Boffey, K. H. Goulding and P. Stanburry TATA McGraw Hill publishing Company Limited, New Delhi.
2. Biotechnology; Smith, Cambridge Press.
3. Advanced molecular Biology; Twyman R. M.
4. Microbiology; Atlas R. M.
5. Microbiology-Prescott L. M.
6. Microbial Genetis; feifilder D.
7. Principles of gene Manipulation; Old and Primrose
8. Principles of Gene Manipulation and Genome; rimpose and Twyman (7^{th} Edition) blackwell Publishing.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. (Biotechnology) (Five Year Integrated)

IBT: 502

Course Title: INTRODUCTION TO BIOTECHNOLOGY

UNIT: 1. Biotechnology:

- A general introduction and overview
- Historical perspective
- Biotechnology an interdisciplinary pursuit
- Safery in Biotechnology
- Problems of pathogenicity of organisms
- Problems of Biologically active biotechnology products
- Public perception of biotechnology
- Ethical issues in biotechnology

UNIT: 2. Substrate for Biotechnology

- Biomass strategy
- Natural raw material
- Availability of byproducts
- Chemical and petrochemical feed stocks as a raw materials

UNIT: 3. Thrust areas of Biotechnology

- rDNA and genetics engineering
- Fermentation
- Process engineering
- Fuels
- Biocatalysts
- Biopestcides and Biofertilisers
- Biopolymers and Bioplastics

- Plants and plant cell culture, and
- Mammalian cell culture
- waste treatment management

UNIT: 4. Future challenges in Biotechnology

- Vaccines for common cold
- Competitive tobacco substitute
- Cheap 'premier' wines
- Reliable self diagnosis kits
- Novels Flowering to assess human response to new foods and drugs
- Site specific targeted drugs

Protection of Biotechnological Inventions :

- Patent protection (IPR)
- trade secrets

REFERENCE :

1. Biotechnology : The Biological principles by M. D. Trevan, s. Boffey, K. H. Goulding and P. Stanburry TATA McGraw Hill publishing Company Limited, New Delhi.

2. Biotechnology : Smith, Cambridge Press.

3. Modern Concepts of Biotechnology by H. D. Kumar, Vikas Publishing House Pvt. Ltd.

4. Elements of Biotechnology by P. K. Gupta, Rastogi Publications.

5. Recombinant DNA Technology by J.D. Watson, J. Gilman, J. Witkowski &

M. Zoller, 1992, 2nd edition, Scientific Americans Books, New York.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. (Biotechnology) (Five Year Integrated)

IBT: 503

Course Title: MOLECULAR BIOLOGY - II

UNIT: 1. Extra Chromosomal Elements

- Plasmids
- Transposons
- Chloroplast and Mitochondrial DNA
- Satellite DNA

UNIT: 2. Viral Genetics

- DNA viruses
    - Double stranded
    - Single stranded
- RNA viruses
    - Double stranded
    - Single stranded

UNIT: 3. DNA – Protein Interactions

- Methods for studying DNA – protein interactions
- Repressor – DNA interactions
- Enzyme – DNA interactions

UNIT: 4. Genome Evolution and Phylogenetics

- Origin of Genomes
- Acquisition of new genes
- Human genome
- DNA based phylogenetic trees

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. (Biotechnology) (Five Year Integrated)

IBT: 504

Course Title: IMMUNOLOGY - II

UNIT: 1. Immunity to Infection:

Mechanisms of humoral and mediated immune response to :

- Bacterial
- Viral &
- Parasitic infection

UNIT: 2. Vaccines

- Active and Passive Immunization
- Designing vaccine for active immunization
- Whole Organism vaccines
- Purified Macromolecules as a vaccines
- Recombinant Vactor vaccines
- DNA Vaccines
- Synthetic peptide vaccines
- Multivalent submit vaccines

UNIT: 3. Antibody engineering:

- Antibody gene cloning
- Recombinant antibody gene expression
- application of engineered antibodies

UNIT: 4. Immunodeficiency :

- Primary immunodeficiency
    - B and T cell deficiency

- Combine immunodeficiency

- AIDS and other acquired or secondary immunodeficiency
    - HIV/AIDS – spread, therapeutic agents and vaccines

REFERENCE :

1. Immunology R. A. Goldsby, T. J. Kindt, B. A. Osborne and J. Kuby, (5th Edition) W. H. Freeman and Company.
2. Immunology (6th edition) : Roitt, Brostoff and Male
3. Roitt's Essential Immunology by Ivan M. Roitt and Peter J. Delves 10th edition.
4. Cellular and Molecular Immunology by Abul K. Andrew H. Lichtman.
5. Basic Immunology : Functions and Disorders of the Immune System by Abul K. Abbas H. Lichtman.
6. Fundamentals of Immunology : Paul W. E. (Eds.) Raven Press, New York, 1988.
7. Instant notes in Immunology : P. M. Lyolyard A. Whelan and M. W. Fager.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. (Biotechnology) (Five Year Integrated)

IBT: 505

Course Title: INTRODUCTION TO BIOINFORMATICS

UNIT: 1.

- Historical developments of Bioinformatics
- Scope of Bioinformatics
- Use of computers in Bioinformatics

UNIT: 2.

- Search Engines
- Biological literature information access through internet
- General overview of Genomics and its applications
- General overview of Proteomics and its applications
- DNA Micro array
- Introduction to Bioinformatics tools and Software

UNIT: 3.

- Information regarding Biological databases
  - Primary Sequence databases
  - Metabolic pathway databases
  - Protein sequence database
  - Protein structure database

UNIT: 4.

- Application of Bioinformatics in
  - Drug discovery and drug development
  - Molecular medicine
  - Personalization medicine
  - Gene therapy
  - Forensic analysis
  - Evolutionary studies
  - Biodiversity

REFERENCES :

1. Orpita Basu, Simminder Kaur, Bioinformatics Databases, Tools and Algorithms, Oxford University Press - 2007.
2. Jean – Michel Claverie and Cedric Notredame. Bioinformatics A beginner's Guide, Wiley Publishing Inc. - 2003.
3. Zoe Lacroix and Terence Critchlow. Bioinformatics Managing Scientific data. Morgan Kaufmann Publisher – 2003.
4. Attawood T. K. and Parry – Smith D. J. Introduction to Bioinformatics Person Education - 2003.
5. C. S. V. Murthy, Bioinformatics, Himalaya Publishing House - 2004.
6. Arthur M. Lesk, Introduction to Bioinformatics, Oxford University Press – 2003.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. (Biotechnology) (Five Year Integrated)

IBT: 506

Course Title: GENETICS ENGINEERING AND MOLECULAR BIOLOGY

- Isolation of lactose non fermentor mutant of *E. coli.* by Physical mutagenesis.
- Isolation of auxotrophic mutants by chemical mutagenesis.
- Extraction, Isolation and characterization of DNA from *E. coli.*
- Isolation and quantification of RNA from yeast.
- Isolation of plasmid DNA by alkaline lysis method.
- Transformation of plasmid DNA.
- Conjugation of *E. coli* by plate method.
- Introduction of β – galactosidase in *E. coli.*